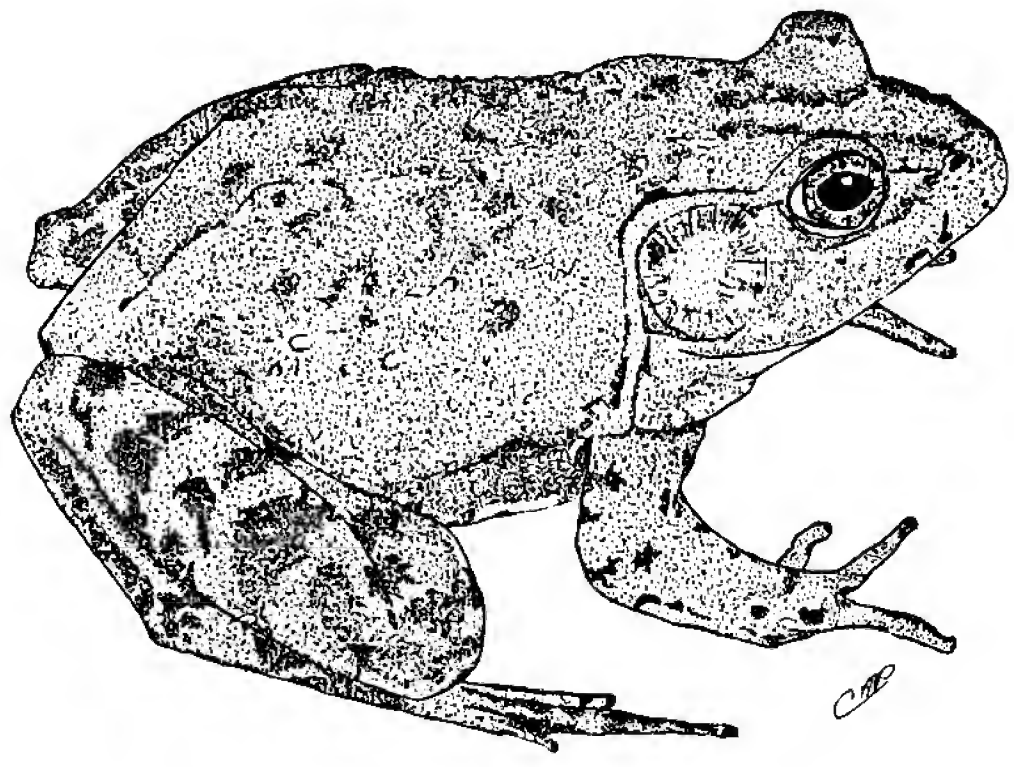
CATESBEIANA



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Introduction

Artificial freshwater lakes are constructed for a variety of purposes. They serve as storm water retention basins, drinking water reservoirs, and are used for a wide range of recreational activities (Cole 1994). In addition, these lakes provide important habitat to many vertebrate species, particularly fish, aquatic reptiles and amphibians. Of the approximately 450 herpetofaunal species found in the United States, half occur in the Southeast with about twenty percent endemic to the region (Conant and Collins 1998; Tuberville et al. 2005). Due to the abundance and diversity of herpetofauna in both terrestrial and freshwater ecosystems, they are considered an excellent ecological indicator of the health of a habitat (Tuberville et al. 2005). In fact, the biomass of the herpetofauna is typically significantly greater than that of endotherms (Iverson 1982; Tuberville et al. 2005). Often, turtles compose a major portion of the vertebrate biomass in freshwater habitats (Congdon et al. 1986). Since standing crop biomass of turtles can be so high, it is likely that they play a significant role in energy flow and nutrient cycling (Bury 1979). The success of turtles is due, in part, to the fact that some species are extremely tolerant of human-impacted ecosystems and thrive in highly modified habitats, even when other organisms are significantly negatively impacted (Mitchell 1988; Conner et al. 2005).

Several species of emydid turtles are known to inhabit lakes in southeastern Virginia. Three groups that have a significant presence are members of the genera *Trachemys*, *Pseudemys*, and *Chrysemys*. One of the more abundant species is *Trachemys scripta*, commonly referred to as the slider turtle (Mitchell 1994). It is a medium-sized turtle with a maximum carapace length of 28.9 cm (Conant and Collins 1991) and can be found in a wide variety of freshwater and brackish ecosystems (Mitchell 1994). There are three recognized subspecies of *T. scripta* (Seidel 2002), with *T. scripta scripta* (the Yellow-bellied Slider) and *T. scripta elegans* (the Red-eared Slider) being the subspecies that are particularly common in Virginia lakes (Mitchell 1994). *T. scripta* is typically the most abundant species when present (Bury 1979).

Chrysemys picta (the Painted Turtle) is another turtle that is abundant throughout Virginia. In

fact, *C. picta* is the most frequently observed basking turtle in Virginia (Mitchell 1994). This turtle tends to be smaller with a maximum carapace length of 18.2 cm (Conant and Collins 1991).

Three turtles from the genus *Pseudemys* can be found in Virginia. They are *Pseudemys concinna concinna* (the Eastern River Cooter), *Pseudemys rubriventris* (the Northern Red-bellied Cooter), and *Pseudemys concinna floridana* (the Coastal Plain Cooter) (Ernst et al. 1994; Mitchell 1994). Turtles from the genus *Pseudemys* are the largest of the three with a maximum carapace length ranging from 39.7 cm to 42 cm (Ernst and Barbour 1972; Conant and Collins 1991). *Pseudemys* turtles are known to actively hybridize with each other and in some cases it is extremely difficult to identify the individuals to species (Seidel and Palmer 1991).

Kinosternid turtles common to southeastern Virginia are *Stenotherus odoratus* (the Stinkpot or Common Musk Turtle) and *Kinosternon subrubrum subrubrum* (the Eastern Mud Turtle). Both of these species are small with maximum carapace length of 12 to 13 cm. *Sternotherus odoratus* is an abundant turtle that rarely ventures on land and basks sporadically (Ernst et al. 1994). Due to its highly aquatic lifestyle, the presence of this turtle could potentially be an indicator of freshwater habitat quality (Mitchell 1994).

Lastly, *Chelydra serpentina* (the Common Snapping Turtle) is abundant throughout the state of Virginia known to inhabit almost all aquatic systems (Ernst et al. 1994). It is an extremely large turtle with a maximum carapace length of 49.4 cm. This turtle is a game animal in Virginia and is actively harvested (Mitchell 1994).

The turtle community has never been studied at Waller Mill Lake. The goal of this study was to document the composition of the turtle community inhabiting the lake.

Methods

All turtles were collected from Waller Mill Lake located in Waller Mill Park, Williamsburg, Virginia. The turtles were captured using hoop nets baited with sardines in oil and bananas. Hoop nets were secured using 1.8 meter plastic garden stakes and were only partially submerged to prevent the drowning of captured turtles. The nets were checked and reset daily. The carapace length (cm) and mass (kg) of all turtles were recorded. The turtles were marked using fingernail polish so recaptures could be documented. All turtles were returned to the site of capture. Collection occurred at various areas around the lake and took place from 17 June 2012 through 8 September 2012.

Results

A total of 129 turtles of five species were captured in the study (Table 1). *Sternotherus odoratus* was the most commonly encountered species with 54 individuals captured (42%

Table 1. Total number of turtles captured at Waller Mill Lake by species.

Species	**Total**	**Male**	**Female**	**Hatchling/Juvenile**	**Percentage of Total Captured**
Chelydra serpentina	6	3	0	3	0.05
Chrysemys picta	9	4	2	3	0.07
Pseudemys rubriventris	38	21	12	5	0.29
Sternotherus odoratus	54	27	27	0	0.42
Trachemys scripta	37	5	8	24	0.29

of the total captured). The total captured for *Trachemys scripta, Pseudemys rubriventris, Chrysemys picta, and Chelydra serpentina* were 37 (29% of the total captured), 38 (29% of the total captured), 9 (7% of the total captured), and 6 (5 % of the total captured) respectively.

Descriptive statistics for carapace length and mass for adult turtles are shown in Table 2.

Table 2. Ranges and means of length and mass for adult turtles captured at Waller Mill Lake. (±) indicates standard deviation. (*) indicates insufficient data to compute the descriptive statistic.

Species	**Sex**	**N**	**Range of Carapace Length (cm)**	**Mean Carapace Length (cm)**	**Range of Mass (kg)**	**Mean Mass (kg)**
Trachemys scripta	Male	5	9.2 - 22.9	15.6 ± 5.21	*	*
	Female	8	16.2 - 26.7	23.1 ± 3.84	0.55 - 2.4	1.8 ± 0.56
Pseudemys rubriventris	Male	22	13.1 - 31.5	21.7 ± 5.85	0.3 - 2.8	1.12 ± 1.92
	Female	12	13.4 - 32.4	28.4 ± 5.38	0.3 - 3.4	2.5 ±0.89
Chrysemys picta	Male	4	10.6 - 14.9	13.3 ± 1.92	0.15 - 0.4	0.3 ±0.11
	Female	2	11.9 – 14.4	*	*	*
Sternotherus odoratus	Male	22	10.1 - 12.9	11.2 ± 0.78	*	*
	Female	27	9.3 - 12.7	10.6 ± 0.73	*	*
Chelydra serpentina	Male	6	*	14.3 ± 3.66	*	*
	Female	0	*	*	*	*

Adult female *Trachemys scripta* ranged in size from 16.2 cm to 26.7 cm carapace length (CL) (mean = 23.1 ± 3.84; n = 8) and weighed 0.55 kg to 2.4 kg (mean = 1.8 ± 0.56; n = 7). Adult male *T. scripta* ranged in size from 9.2 cm to 22.9 cm CL (mean = 15.6 ± 5.21; n = 5). Insufficient data were collected on male *T. scripta* to compute descriptive statistics on mass. Adult female *Pseudemys rubriventris* ranged in size from 13.4 cm to 32.4 cm CL (mean = 28.4 ± 5.38; n = 12) and weighed 0.3 kg to 3.4 kg (mean = 2.5 ± 0.89; n = 12). Adult male *Pseudemys rubriventris* ranged in size from 13.1 cm to 31.5 cm CL (mean = 21.7 ± 5.85; n = 22) and weighed 0.3 kg to 2.8 kg (mean = 1.1 ± 0.79; n = 22). Only two adult female *Chrysemys picta* were collected and measured 11.9 cm and 14.4 cm CL. Adult male *C. picta* ranged in size from 10.6 cm to 14.9 cm CL (mean = 13.3 ± 1.92; n = 4) and weighed 0.15 kg to 0.4 kg (mean = 0.3 ± 0.11; n = 4). Adult female *Sternotherus odoratus* ranged in size from 9.3 cm to 12.7 cm CL (mean = 10.6 ± 0.73; n = 27). Adult male *S. odoratus* ranged in size from 10.1 cm to 12.9 cm CL (mean = 11.2 ± 0.78; n = 22). Due to equipment limitations, *S. odoratus* were too small to be accurately measured in terms of mass. Six juvenile male *Chelydra serpentina* were collected with a mean CL of 14.3 cm ± 3.66.

Discussion

The turtle community structure of Waller Mill Lake was typical for lakes in southeastern Virginia. In addition, the composition was found to be very similar to Lake Maury, Newport News, Virginia (Demnicki 2007) and Bethel Reservoir, Hampton, Virginia (Galvez et al. 1998). However, *T. scripta* was the dominant species collected from Lake Maury comprising 65% of the total captures (Demnicki 2007) whereas *Sternotherus odoratus* was encountered most often at Waller Mill Lake. Additionally, the introduced *Graptemys pseudogeographica kohnii* (Mississippi Map Turtle) is known to inhabit Lake Maury (Demnicki 2007) but was not encountered at Waller Mill Lake.

Another distinction between the turtle communities of Waller Mill Lake and Lake Maury were the large number of hatchlings collected at Waller Mill Lake. A total of 35 hatchlings were encountered. While both studies were conducted during the same time of year, this is in stark contrast to Lake Maury where no hatchlings were captured or observed (Demnicki 2007). The apparent reproductive success at Waller Mill Lake may be due, in part, to the presence of an invasive aquatic plant that is not present at Lake Maury. The plant, which appears to be *Najas minor* (Waternymph), has invaded much of the shallow depths in and around the more popular areas of the lake. Not only were hatchlings collected in traps placed in these areas, but a large number of hatchlings were observed swimming and basking in the areas where the invasive plant was present (Zahn, personal observation). It is also important to note that the turtles at Waller Mill Lake appear to being consuming large amounts of the invasive *N. minor* based on cursory observations of their feces during feeding trials (Zahn, personal observation).

During this study, a single individual of *Trachemys scripta scripta* was collected compared to 36 *Trachemys scripta elegans*. Populations of the native *T. scripta scripta* are being impacted by intergradation with the non-native *T. scripta elegans*, which threatens the genetic integrity of *T. scripta scripta* (Mitchell 1994). Mitchell (1994) predicts that most populations of the native *T.*

scripta scripta in Virginia will be replaced with populations of intergrades in the future. During a field investigation conducted at Lake Maury, Newport News, Virginia, only 2 *T. scripta* captured out of 69 were diagnosable as *T. scripta scripta* (Demnicki 2007). Most of the *T. scripta* captured appeared to be intergrades of varying degree and most were phenotypically indistinguishable from pure *T. scripta elegans* (Demnicki 2007). This result is consistent with Mitchell's (1994) prediction. In fact, the Red-eared Slider is considered one of the 100 worst invasive species worldwide (Lowe et al. 2000).

Acknowledgments

We would like to thank the management and staff of the City of Williamsburg Department of Parks and Recreation and Waller Mill Park for allowing us to collect turtles for this research. We would also like to thank Athita Danek and Rachel Demnicki for the many hours of hard work assisting in the field. This work was conducted under a scientific collection permit issued by the Virginia Department of Game and Inland Fisheries (Permit number 044876) and was approved by the University of Nebraska at Kearney Institutional Animal Care and Use Committee (IACUC number 032912).

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Diet Selection in Three Emydid Turtle Species

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Introduction

Turtles of the genera *Trachemys*, *Pseudemys*, and *Chrysemys* are extremely common in southeastern Virginia and can make up a significant portion of the vertebrate biomass in freshwater systems (Congdon et al. 1986). One of the more abundant species is *Trachemys scripta*, commonly referred to as the Slider Turtle (Mitchell 1994). *T. scripta* is typically the most abundant species when present (Bury 1979). The success of *Trachemys scripta* may be, in part, due to its feeding ecology. *T. scripta* is omnivorous with a generalist diet (Ernst et al. 1994). It is best described as extremely opportunistic, utilizing a wide range of food including many different species of algae and vascular plants, invertebrates, fish, and all life stages of frogs (Ernst and Barbour 1972; Parmenter and Avery 1990; Ernst et al. 1994).

Chrysemys picta (the Painted Turtle) is another omnivorous turtle that is abundant throughout Virginia and is the most frequently observed basking turtle in Virginia (Mitchell 1994). This turtle is known to eat a wide variety of algae and vascular plant material, invertebrates and frogs (Ernst and Barbour 1972; MacCulloch and Secoy 1983; Ernst et al. 1994).

Pseudemys rubriventris (The Red-Bellied Cooter) inhabits many freshwater ecosystems in southeastern Virginia. Adult turtles are mainly herbivorous, however *P. rubriventris* has been known to consume animal material on occasion (Ernst et al. 1994). Although algae and vascular plants compose most of their documented diet, these turtles are also known to consume snails, crayfish, and tadpoles (Ernst et al. 1994).

Considering the documented overlap in diet, it is possible that *Trachemys scripta*, *Pseudemys rubriventris*, and *Chrysemys picta* are utilizing the same resources and thus participating in competitive interactions. Moreover, large populations of turtles could potentially have an impact on prey species. Since all three turtle species described above are known to consume amphibian larvae (Ernst et al. 1994), the combined effects of these turtles could substantially lower amphibian recruitment. The goal of this study was to determine if there is niche overlap in the

diets of *Trachemys scripta*, *Pseudemys rubriventris*, and *Chrysemys picta* and establish if any of the turtle species would select amphibian larvae as a diet item.

Methods

All turtles were collected from Waller Mill Lake located in Waller Mill Park, Williamsburg, Virginia. The turtles were captured using hoop nets baited with sardines in oil and bananas. Hoop nets were secured using 1.8-meter plastic garden stakes and were only partially submerged to prevent the drowning of captured turtles. The nets were checked and reset daily. The carapace length (cm) and mass (kg) of all turtles were recorded using calipers and a spring scale. The turtles were marked using fingernail polish to ensure that the same individual was not used in feeding trials more than once. Adult turtles belonging to the species *Trachemys scripta*, *Pseudemys rubriventris*, and *Chrysemys picta* were transported back to the lab for feeding trials. No juveniles were collected for the feeding trials to prevent sampling bias as juvenile *T. scripta* and *C. picta* are known to be mainly carnivorous with a shift to an omnivorous diet as they reach maturity (Congdon et al. 1992; Bouchard and Bjorndal 2006). Turtles belonging to all other species were returned to the lake. Collection occurred at various areas around the lake and took place from 17 June 2012 through 8 September 2012.

The feeding trials were conducted using methods adapted from Koch (2010). Turtles were held in plastic swimming pools covered in 2.5 cm (1 in.) hex-shaped poultry netting to deter predators prior to feeding trials. Landscaping stones were provided for basking sites and a portion of the pool was covered with a tarp for shade.

Feeding trials were conducted in 62 L (66 qt.) clear, plastic storage containers. The feeding trial containers were set up in the same manner describe above. Six containers were set up so numerous trials could occur simultaneously. One turtle was placed in each container for a fasting period of 24 hours.

After the fasting period, each turtle was offered the control diet item along with one experimental diet item. The vascular plant, *Sagittaria*, served as the control item, as it is a known diet item of all three turtle species and vascular plant material was shown to constitute the majority of the diet of all three turtle species in a previously conducted study (Demnicki 2007). The experimental diet items were *Chara* (algae) and *Lithobates* tadpoles (up to 5 cm in length). During trials in which they were included, a single, live tadpole was offered. The diet items were left for a period of four hours. After the four-hour time period, the containers were checked to see if the turtles had consumed the control item, the experimental item, both items or neither item and that information was recorded.

The turtles were fasted for another 24-hour period and a second trial was conducted with the control and the other experimental diet item. After the feeding trials were completed on each turtle, the turtles were returned to the lake and released at the location from which they were captured. If the turtle(s) could not be immediately returned to the lake, they were held in a separate pool fitted in the manner described above until such time that they could be returned.

After all feeding trials were completed; the data were compiled for each species and analyzed using the Fisher Exact Probability Test to determine if there was a significant difference in the preference for different food items for each species.

Results

The results of the feeding trials are shown in Table 1. *Trachemys scripta* and *Chrysemys picta* exhibited no dietary preferences during feeding trials ($p = 0.096$ and $p = 0.999$) accepting equally *Sagittaria*, *Chara*, and *Lithobates* tadpoles. However, *Pseudemys rubriventris* demonstrated a dietary preference for *Sagittaria* ($p = 0.0358$).

Table 1. Number of times turtles consumed diet items during laboratory feeding trials. Numbers in parentheses represent sample size. (*) indicates a significant difference ($p < 0.05$) using Fisher Exact Probability Test.

Feeding Trial Selections	*Trachemys scripta* (8)	*Pseudemys rubriventris* (11)*	*Chrysemys picta* (6)
Sagittaria* vs. *Chara			
Sagittaria only	3	3	4
Chara only	0	0	0
Neither item	5	3	1
Both items	0	5	1
***Sagittaria* vs. *Lithobates* tadpole**			
Sagittaria only	1	7	4
Tadpole only	2	0	0
Neither item	2	4	0
Both items	3	0	2

Discussion

Trachemys scripta and *Chrysemys picta* were found to exhibit no dietary preferences when offered a variety of items they are known to consume. However, *Pseudemys rubriventris* exhibited a preference for plant material. This result is reasonable as *T. scripta* and *C. picta* are classified as omnivorous and *P. rubriventris* is mainly herbivorous. While *T. scripta* and *C. picta* exhibited no statistically significant preference in diet, they consumed *Sagittaria*, a vascular plant, more often when compared to other diet items. This is consistent with results from a previous study of wild turtles conducted at Lake Maury, Newport News, Virginia (Demnicki 2007). Vascular plant material was found in the fecal samples of 77% of female and 83% of male *T. scripta*, making up the vast majority of the volume of the samples (Demnicki 2007). Likewise, vascular plant material was found in 100% of the fecal samples from male and female

C. picta, making up almost 100% of the volume (Demnicki 2007). In addition, studies show that populations of *T. scripta* in Tennessee, Florida and Louisiana have mainly a plant-based diet (Marchand 1942; Cagle 1950).

While *Trachemys scripta* and *Chrysemys picta* appear to have a diet that consists mainly of vascular plant material in lakes of the Southeast, they do not in other areas of the United States. Populations of *T. scripta* in Illinois were found to consume equal amounts of plant and animal material (Smith 1961). This result is consistent with other populations of *T. scripta* in Illinois (Dreslik 1999). *Chrysemys picta* in high-elevation habitats in Colorado had a diet that was dominated by aquatic snails (*Lymnaeidae* and *Succineidae*) along with damselflies (*Odonata*) and caddisflies (*Trichoptera*) (Cooley et al. 2003). Knight and Gibbons (1968) studying Michigan populations of *C. picta* in a polluted river found that the turtle's diet was about 75% animal matter. In the Pacific Northwest, two populations of *C. picta* had a diet that consisted of a significant amount of insect larvae and amphipods (Lindeman 1996). Similarly, MacCulloch and Secoy (1983) found that *C. picta* in Saskatchewan had a carnivorous diet that likely resulted in the populations having both larger body sizes and larger clutches.

The herbivorous diet of *Pseudemys rubriventris* at Waller Mill Lake is consistent with most of the published literature on *Pseudemys* diet. Fecal analysis of turtles at Lake Maury, Newport News, Virginia found the diet of *Pseudemys* was 100% herbivorous with vascular plant material being the major diet item (Demnicki 2007). While *P. rubriventris* is known to consume algae, *Chara* (a filamentous algae) did not appear to be a preferred diet item of the Waller Mill turtle population, only being consumed a total of six times during feeding trials. *Chara* was only consumed along with *Sagittaria* and never by itself.

While vascular plants appear to be the major component of their diets, *Trachemys scripta* and *Chrysemys picta*, both omnivorous species, consumed *Lithobates* tadpoles during feeding trials. Omnivorous turtles are considered opportunistic predators and typically consume amphibians when encountered (Toledo et al. 2007). Since the biomass of turtles in freshwater habitats is usually quite large, the effect of predation on amphibians could potentially be substantial (Congdon et al. 1986). Hecnar and M'Closkey (1997) found that amphibian species richness was significantly reduced in ponds that also supported populations of predatory fish when compared to ponds that had non-predatory fish species or no fish at all. In addition, Gregoire and Gunzburger (2008) found that even fish species with a small body size could have a negative effect on amphibian populations. It is reasonable to suppose that populations of turtles that consume amphibian larvae could result in a similar outcome. For example, it appears that the introduction of the non-native *Trachemys scripta elegans* has had a significant negative impact on amphibian populations throughout Europe (Polo-Cavia et al. 2010).

Despite these observations, certain factors seem to impact the level of turtle predation observed. In laboratory experiments, Feder (1983) found that movements like swimming and surfacing to breathe attract the attention of *Chrysemys picta* and increase the rate of predation on *Lithobates* tadpoles. Along with attractive movements, turtles tend toward predation on larger tadpoles (Gomez-Mestre and Keller 2003). There also appears to be a difference in the degree

of palatability among species of amphibian larvae, which impacts whether or not a turtle will consume the tadpole (Gomez-Mestre and Keller 2003). However, Koch (2010) found that during feeding trials *C. picta* did not exhibit a preference when offered larvae from five species of amphibian belonging to different genera, including a salamander (*Ambystoma mavortium*).

In conclusion, the omnivorous *Trachemys scripta* and *Chrysemys picta* exhibited no dietary preference, while the herbivorous *Pseudemys rubriventris* preferentially consumed plant material during this study.

Acknowledgments

We would like to thank the management and staff of the City of Williamsburg Department of Parks and Recreation and Waller Mill Park for allowing us to collect turtles for this research. We would also like to thank Athita Danek and Rachel Demnicki for the many hours of hard work assisting in the field. This work was conducted under a Scientific Collection Permit issued by the Virginia Department of Game and Inland Fisheries (Permit number 044876) and was approved by the University of Nebraska at Kearney Institutional Animal Care and Use Committee (IACUC number 032912).

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Timing of Juvenile Amphibian Dispersal from Small Ponds in Southern Virginia

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Introduction

Small ponds provide important breeding sites for many amphibian species. Whereas some adult anurans may remain in or near ponds throughout the year, the dispersal of juveniles away from ponds after metamorphosis is typical (Martof 1953; Schroeder 1976). In a previous study using pitfall traps in forests on the campus of Ferrum College, Fredericksen et al. (2010) found that high relative humidity and rainfall initiated the dispersal of juvenile amphibians from ponds during the summer, but different amphibian species dispersed at different times. The peak dispersal for juvenile Green Frogs (*Lithobates clamitans*) occurred in July but the Red-Spotted Newt (*Notophthalmus viridescens*) had peak dispersal in September. The peak of juvenile dispersal for Bullfrogs (*Lithobates catesbeiana*) and Pickerel Frogs (*Lithobates palustris*) was less clear. These sampling plots, however, were located in forests more than 100 m from the presumed natal ponds and the timing of dispersal was uncertain since amphibians may have found refuge under leaf litter between dispersal from pond and capture in the forest pitfall arrays. Martof (1953) found the dispersal timing of green frogs was positively correlated with both precipitation and humidity, while Timm et al. (2007) found that the amount of precipitation was also important in the departure of juvenile amphibian species from breeding ponds. They also observed that the timing of juvenile dispersal varied among amphibian species.

The objective of our study was to determine the timing of juvenile dispersal of pond-breeding amphibians from small ponds in southwestern Virginia. Specifically, we wanted to determine the time of year and duration of juvenile dispersal for different species of frogs, toads and the Red-spotted Newt. We also investigated whether dispersal events were linked to rainfall events and if amphibians preferentially dispersed in certain directions from the pond.

Methods

This study was conducted on two different ponds on the campus of Ferrum College in Franklin County, Virginia over a three-year period (2011-2013). Chapman Pond is a small (0.5 ha) impoundment pond on the western side of campus. It is surrounded on three sides by forest and on one side by a grassy field. On each of two of the forested sides of this pond in 2011, we installed a 20 m segment of drift fence approximately 2 m from the edge of the pond, parallel with the shoreline. Woven plastic silt fence (75 cm tall) was supported by wooden stakes and the bottom of the fence attached to the ground with landscaping pins. Flush with the side of the fence, we buried three 10 liter plastic buckets in the ground to serve as pitfall traps on each side of the fence. Pitfall traps on the inside (pond side) of the fence were likely to capture juveniles dispersing from the pond, while traps on the outside of the fence (facing away from the pond)

would likely capture individuals trying to enter the pond. The buckets were installed in the middle and at the ends of the silt fence and holes were drilled to allow for water drainage. Bucket lids were supported over the buckets using stakes in order to provide shelter for captured amphibians. During periods when we were not sampling, lids were closed over the buckets. One stretch of fence was located on the west side of Chapman pond located along the border of a small Loblolly Pine (*Pinus taeda*) plantation. Another fence was located along a mature mixed hardwood forest on the east side of the pond. In 2013, we also installed an additional fence along the grassy field on the north side of the pond. At Chapman Pond, we trapped from June 5-October 31 in 2011, March 1- October 31 in 2012, and March 10-October 15 in 2013.

We also installed one 20-m drift fence with pitfall traps around a smaller (0.05 ha) cattle watering pond on the eastern side of campus that bordered a palustrine wetland. The other sides of the pond included cattle pasture and dense Alder (Alnus *sp.*) thickets. The water was much shallower and more turbid than Chapman Pond. This site was trapped only in 2011 and part of 2012 (until July 9) because of damage to the traps from cattle which had gained access to the side of the pond where the pitfall traps were placed.

The number, species, life stage, and side of fence of capture for each amphibian was recorded each day during the sampling period. The life stage of amphibians was based on approximate body size and categorized as juvenile (recent hatchling or metamorph), subadult (not likely to be a recent metamorph, but not normal adult body size), or adult. Captured animals were not marked and were released on the opposite side of the fence from where they were captured. Juveniles captured on the inside of the fence were released at least 3 m from the drift fence away from the pond in order to reduce the possibility of recapture.

In 2012, we collected rainfall data on a daily basis from June 7 – October 15 using a standard rain gauge in an open area approximately 1 km from each pond to test for a correlation between rainfall and the number of amphibian captures.

Results

Overall, the Red-spotted Newt was the most commonly captured species, followed by the Green Frog, Pickerel Frog, and Bullfrog (Table 1). The Green Frog was the most commonly captured species at the cattle pond. A large number of juvenile newts were captured leaving the ponds, especially Chapman Pond, but most newt captures were what we called “subadults”, individuals still in the terrestrial “eft” stage that were apparently returning to the pond to enter the adult stage. We did not capture any aquatic adult newts. Most frog captures were juveniles (new metamorphs). We did not capture any juvenile American Toads (*Anaxyrus americanus*) in either pond, despite capturing adults and observing mating toads each year at Chapman Pond.

Table 1. Captures of adult, subadult, and juvenile amphibians at Chapman Pond (2011-2013) and a small cattle pond (2011-2012) on the campus of Ferrum College in Franklin County Virginia.

Species	**Chapman Pond**			**Cattle Pond**		
	Adult	Subadult	Juvenile	Adult	Subadult	Juvenile
American Toad (*Anaxyrus americanus*)	29	0	0	20	1	0
Eastern Narrow-mouthed Toad (*Gastrophryne carolinensis*)	1	0	0	0	0	0
Bullfrog (*Lithobates catesbeianus*)	2	1	64	0	4	0
Green Frog (*Lithobates clamitans*)	8	3	181	7	2	41
Pickerel Frog (*Lithobates palustris*)	16	0	82	0	7	5
Wood Frog (*Lithobates sylvaticus*)	0	0	2	0	0	1
Red-spotted Newt (*Notophthalmus viridescens*)	0	505	256	0	11	3
Spring Peeper (*Pseudacris crucifer*)	4	0	0	0	0	0

Of all juveniles of the four most commonly captured species (Red-spotted Newt, Green Frog, Pickerel Frog, and Bullfrog), 90% were captured in traps on the inside fence, indicating that they were likely dispersing from the pond. For Red-spotted Newt subadults, 92% were captured in traps on the outside fence, indicating that they were trying to enter the pond. For adult frogs and toads, 70% were captured in traps on the outside fence. The majority of adult or subadult anurans captured were between March-May.

Green Frog juveniles dispersed earliest in the year, with Pickerel Frog juveniles dispersing soon afterwards (Figure 1, Table 2). In 2013, four juvenile Green Frogs and four Bullfrogs were captured following a warm rain on March 12. These individuals were undoubtedly juveniles that had overwintered in the pond and the capture dates were clearly disjunct from the main juvenile dispersal period for these species beginning in late May to mid-June. Juveniles of both Green Frogs and Pickerel Frogs dispersed predominantly in the latter half of June. Dispersal of Bullfrog juveniles was the latest of all species, consistently began in mid-July with the largest number of captures occurring from late July to early September. Juvenile Red-Spotted Newts began to disperse in late June to mid-July with peak capture timing later than Green Frogs and Pickerel Frogs, but earlier than that of Bullfrog juveniles (Figure 1). Juveniles of all four of the above-mentioned species continued to disperse at least into October when trapping ceased. Red-Spotted Newts that were presumably ending their terrestrial stage were captured in traps on the outer edge of the pond beginning late August or early September with peak captures occurring in late September.

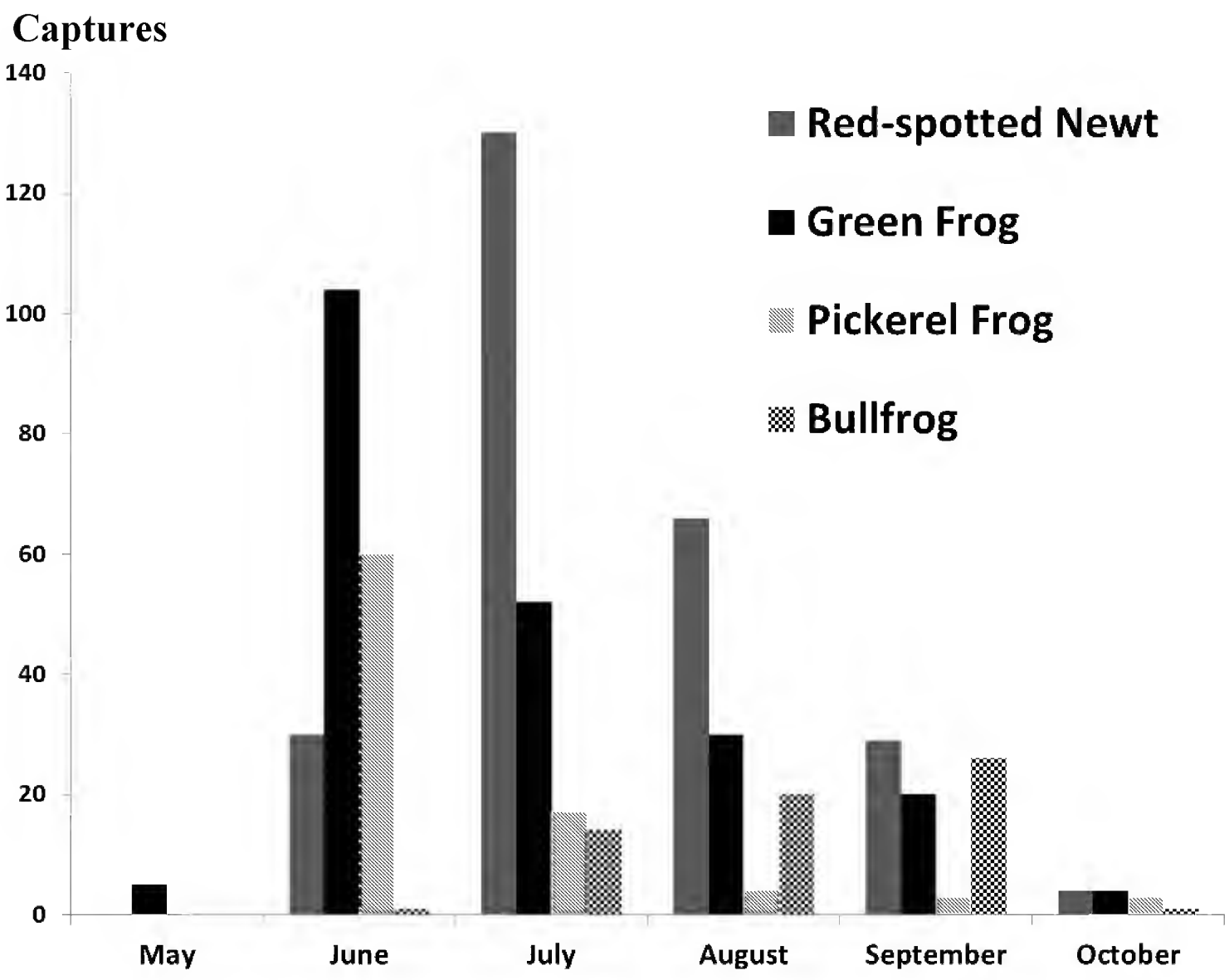
Table 2. Juvenile dispersal dates of selected amphibian species from ponds in southwestern Virginia 2011-2013.

Species	**Earliest Dispersal***			**Latest Dispersal**			**Median Dispersal**			**Highest captures**		
	2011	**2012**	**2013**	**2011**	**2012**	**2013**	**2011**	**2012**	**2013**	**2011**	**2012**	**2013**
Red-spotted Newt	7/12	6/21	6/30	9/30	9/19	10/7	8/21	8/5	8/19	9/8	8/15	7/17
Green Frog	6/12	5/23	6/3	9/28	10/11	9/14	8/2	8/1	7/24	6/19	6/21	6/19
Bullfrog	7/13	7/15	7/10	9/28	10/2	10/7	8/20	8/23	8/24	9/6	9/2	7/28
Pickerel Frog	6/18	6/13	6/23			8/16	8/15	8/14	7/19	6/19	6/13	6/30

*- A few isolated dispersal events for Green Frog and Pickerel frog were recorded in March and April, 2013.

Species	**Earliest Return**			**Latest Return**			**Median Return**			**Highest captures**		
	2011	**2012**	**2013**	**2011**	**2012**	**2013**	**2011**	**2012**	**2013**	**2011**	**2012**	**2013**
Red-spotted Newt	9/8	9/5	8/28			10/8	9/29	9/25	9/17	9/30	9/19	9/22

Figure 1. Captures of dispersing juveniles by month (May-October) summed over the 2011-2013 sampling seasons for the four most common amphibian species in two ponds on the campus of Ferrum College.



During the three years of the study, dispersing juvenile Green Frogs, Bullfrogs, Pickerel Frogs, and Red-spotted Newts from Chapman Pond were captured on the mixed pine-hardwood forest 2-3 times more than the side with the mature Loblolly Pine plantation. Of the 503 Red-spotted Newts captured returning to the pond, 94% were captured in traps on the side facing the mixed-pine hardwood forest. In 2013, when an additional fence was installed along the side of the pond facing the grassy border, the side of the pond with the mixed pine-hardwood forest again had 2-3 times as many juvenile captures as the side with the Loblolly Pine border. The grassy side of the pond had 2-7 times fewer juvenile captures than the side with the Loblolly Pine plantation, except for the Bullfrog, which had two more captures on the grassy border compared to the pine plantation. No juvenile Red-spotted Newts were captured on the side with the grassy border.

There was a weak, but significant ($R^2 = 0.06$, $p = 0.03$) relationship between the number of amphibian captures and precipitation within the previous 24 hours of checking traps. The relationship was stronger ($R^2 = 0.47$, $p = 0.001$) between captures and precipitation within the previous 48 hours of checking traps.

Discussion

Four main species were captured at our study ponds, the Red-spotted Newt, Green Frog, Pickerel Frog, and Bullfrog. The high captures of these four species was due to the large number of juveniles dispersing from the pond. Only adult American Toads were captured. Spring peepers were captured only as adults in the early spring and included two pairs in amplexus. While spring peepers have been observed calling from the pond, no juveniles were captured. The lack of captures of this species could be at least partially related to its climbing ability which may have allowed it to escape from pitfall traps and climb the drift fence. A few juvenile Wood Frogs were captured, but this species typically breeds in vernal pools, not permanent water bodies such as those in our study. The Eastern Narrow-mouthed Toad was only captured once and is a recent new record for Franklin County (Fredericksen et al. 2007). Most captures were made around Chapman Pond, the larger of the two ponds. The cattle pond was small with turbid water and only trapped in 2010 and part of 2011. Most captures at the cattle pond were Green Frogs and Bullfrogs, both of which are generalist species (Hecnar and M'Closkey 1997; Beane et al. 2010) and seemingly tolerant of turbid water (personal observation).

Despite observations of breeding behavior in both ponds and frequent adult captures, it is interesting to note the lack of juvenile captures of American Toads. Toads prefer permanent breeding sites, such as ponds, provided that there are shallow areas, which is the case for our ponds (Klemens 1993). Petranka et al. (1994) noted that wood frog tadpoles are strong predators on toad eggs, but few wood frogs were captured in our study. Relyea et al. (2005) also noted strong predation pressure on American Toad tadpoles by Red-spotted Newts, which are abundant in Chapman Pond. We are not aware of any other studies, however, showing selective predation or parasitism of American Toad eggs or tadpoles compared to the other species that were frequently captured in this study. Berger et al. (1989) found American Toad tadpoles much more sensitive to agricultural runoff than ranid tadpoles. This sensitivity may explain the lack of reproductive success in the cattle pond, but not Chapman Pond, which has a lower sediment load because it is not impacted by cattle. In addition, metamorphic toads were observed near another pond on campus (Adams Lake), which is much more eutrophic than Chapman Pond.

Similar to other studies (Mazerolle 2001; Paton and Crouch 2002), we found a temporal segregation in the use of breeding ponds and differential dispersal among amphibian species in our study. Juvenile dispersal varied among species with some overlap, but usually with different peak dispersal periods. Green Frogs were the earliest to disperse, followed by Pickerel Frogs, Red-Spotted Newts, then Bullfrogs. Dispersal varied over a wide range of dates for all species. This result differed from Timm et al. (2007) who observed a clearly defined window for juvenile dispersal of amphibians from ponds in western Massachusetts, although it varied among species. Schroeder (1976) found that 97% of juvenile green frogs dispersed within 27 days from Mountain Lake, Virginia, which again differed from the prolonged dispersal of Green Frogs in our study. Green Frogs have a long breeding season and a relatively long tadpole stage (Oldham 1967; Pough and Kamel 1984). Tadpoles of both Green Frogs and Bullfrogs frequently overwinter in ponds, not emerging until the next spring (Beane et al. 2010). In our study, juvenile Green Frogs and Pickerel Frogs were captured leaving the pond as early as March and April, which is during the early breeding season for these species.

Juvenile dispersal was correlated with rainfall events. There was a better linkage with rainfall within the previous 48 hours compared to that within the previous 24 hours perhaps indicating that juvenile amphibians continued to disperse as long as moisture on the forest floor remains high. Relative humidity was not measured in this study, but we infer that higher humidity would follow recent rain events. Highest capture dates also coincided with mid-summer days when air and water temperatures were high. Other studies have similarly found juvenile amphibian dispersal from ponds, and amphibian movements in general, to be positively correlated with precipitation, humidity and temperature (Martof 1953; Healy 1975; Schoeder 1976; Pough and Kamel 1984; Timm et al. 2007; Roe and Grayson 2008). Semlitsch (2008) observed that nocturnal rainfall may be particularly important with respect to the timing of amphibian movements from ponds.

Juvenile movement away from ponds may be a mechanism for reducing overpopulation and increasing outbreeding within a metapopulation (Rothermel 2004; Cushman 2006), although risks of mortality from dispersal may confer higher fitness with philopatry to natal ponds (Semlitsch 2008). For some species, few frogs may return to ponds. For example, Schroeder (1976) found that only 6 of 468 marked juvenile Green Frogs returned to their natal pond within the next year. For other species, such as the Red-Spotted Newt, juveniles may leave the pond and enter their terrestrial stage, but may return to it when reaching the adult stage (Gill 1978). In this case, what we are calling dispersal for this species, is perhaps the first phase of migration (Semlitsch 2008), although we do not know if some of these newts are from other ponds.

Amphibian species appeared to have a preference for the direction of dispersal from the largest pond in our study, which had drift fences and pitfall traps placed on three sides with differing plant communities on each of the three sides. Most amphibians dispersed from the West side of the pond which was bordered by a mature mixed pine-hardwood forest. This was particularly true for Red-Spotted Newts, only a few of which dispersed from the South side of the pond bordered by a mature Loblolly Pine plantation and none dispersed from the North side of the pond that was bordered by tall grasses and sedges. In a study in Maine, deMaynadier and Hunter (1999) observed that juvenile amphibians appear to show a preference for dispersing in areas with dense overstory and understory cover, although Schroeder (1976) found that Green Frog dispersal was random from a pond in Mountain Lake, Virginia. Birchfield and Deters (2005) found that frogs tended to disperse through the habitat type that presented the least resistance to movement. In our study, the two forested sides of the pond probably presented less resistance to movement than the tall grass. The movement of Red-spotted Newts to Chapman Pond in the late summer and early fall occurred almost exclusively from the mature mixed hardwood-pine forest on the west side of the pond, perhaps because this forest provided a litter layer that provided more suitable cover and facilitated travel more than the sides with the pine plantation and grass-sedge vegetation. We also noticed that returning newts were more frequently captured immediately after the passage of cold fronts in late August through mid-September.

In summary, juveniles of pond amphibian species differed with respect to the timing of dispersal from ponds in southwestern Virginia over a three-year study, although the period of dispersal

overlapped among species and was more prolonged during the summer and fall compared to reports from other studies. The most common species of dispersing amphibians included the Green Frog, Pickerel Frog, Bullfrog, and Red-spotted Newt. American Toads were observing breeding in the ponds, but no dispersing juveniles were seen or captured. Amphibian dispersal was positively correlated with rainfall during the previous 24-48 hours and there was a preference for dispersal into mature mixed pine hardwood stands compared to a pine plantation or grass-sedge habitat. The arrival to the pond of Red-Spotted Newts that were transitioning from the terrestrial to aquatic phase of their life cycle was also recorded and peaked in late summer and early fall.

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***Hyla cinerea* (Green Treefrog). Virginia**: Amelia County 37° 16' 51.32" N, 77° 41' 59.94" W. 07 June 2014. Brian Munford.

Range Extension: On 07 June 2014, while conducting opportunistic field survey work in Amelia County, a Green Treefrog call was heard and recorded. This call was located in a backwater on the south side of Lake Chesdin, at the end of Camera Mill Road. This represents a westward expansion of the known range of the species. An electronic recording has been deposited with the Virginia Herpetological Society (VHS Archive # 306).

Brian Munford
4021 Northrop Street
Richmond, Virginia 23225

***Hyla cinerea* (Green Treefrog) VA**: Brunswick Co., State Route 726 south of State Route 137 (36° 53'07.58"N, 77° 50'45.00"W). 27 May 2014. Brian Munford

County Record: On 27 May 2014, at approximately 22.15h, while conducting opportunistic survey work, a Green Treefrog call was noted and recorded. This observation is a new county record and represents a westward expansion in the distribution map of this species in Virginia (Mitchell J.C. and K.K. Reay, 1999, Atlas of Amphibians and Reptiles in Virginia, Special Publication No. 1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.) A digital recording has been deposited in the VHS archives (Digital voucher # 298)

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Hyla cinerea* (Green Treefrog) VA**: Dinwiddie Co., State Route 675 (37° 08.578 N, 77° 26.635 W). 26 June 2013. Brian Munford

County Record: On 26 June 2013, at approximately 22.45h, while conducting opportunistic survey work, a Green Treefrog chorus was noted and recorded. This observation is a new county record and fills a hiatus in the distribution map of this species in Virginia (Mitchell J.C. and K.K. Reay, 1999, Atlas of Amphibians and Reptiles in Virginia, Special Publication No. 1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.) A digital recording has been deposited in the VHS archives (Digital voucher # 304)

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Hyla cinerea* (Green Treefrog) VA**: Mecklenburg Co., upper reaches of Lake Gordon (36° 42'29.64" N, 78° 12'20.36" W). 27 May 2014. Brian Munford

Range extension for Mecklenburg County: On 27 May 2014, at approximately 19.45h, while conducting opportunistic survey work, a large Green Treefrog chorus was noted and recorded. This observation is an extension of the range for Mecklenburg of about 14 km north of Dick Cross Wildlife Management Area where they were first reported last year (Sattler, P. and J. Gibson. 2014. Results of the 2013 HerpBlitz at Dick Cross Wildlife Management Area, Mecklenburg County, Virginia. Catesbeiana 43(1):15-34.) A digital recording has been deposited in the VHS archives (Digital voucher # 299)

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Hyla femoralis* (Pine Woods Treefrog) VA**: Amelia Co., State Route 615 (Namozine Rd.) at Sweathouse Creek (37° 15.259 N, 77° 51.743 W). 06 June 2013. Brian Munford

County Record: On 06 June 2013, at approximately 23.45h, while conducting opportunistic survey work, a Pine Woods Treefrog chorus was noted and recorded. This observation is a new county record and represents a westward expansion in the distribution map of this species in Virginia (Mitchell J.C. and K.K. Reay, 1999, Atlas of Amphibians and Reptiles in Virginia, Special Publication No. 1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.) A digital recording has been deposited in the VHS archives (VHS Archive #312)

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Hyla femoralis* (Pine Woods Treefrog) VA**: Caroline Co., State Route 677 (37° 49.644 N, 77° 20.239 W). 28 June 2013. Brian Munford

County Record: On 28 June 2013, at approximately 22.50h, while conducting opportunistic survey work, a Pine Woods Treefrog chorus was noted and recorded. This observation is a new county record and northern expansion of the distribution of this species in Virginia (Mitchell J.C. and K.K. Reay, 1999, Atlas of Amphibians and Reptiles in Virginia, Special Publication No. 1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.) A digital recording has been deposited in the VHS archives (Digital voucher # 305)

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Hyla femoralis* (Pine Woods Treefrog) VA**: Dinwiddie Co., State Route 626, Flatfoot Rd. at Winfields Millpond (36° 57.503 N, 77° 29.663 W). 26 June 2013. Brian Munford

County Record: On 26 June 2013, at approximately 22.15h, while conducting opportunistic survey work, a Pine Woods Treefrog chorus was noted and recorded. This observation is a new county record and fills a hiatus in the distribution map of this species in Virginia (Mitchell J.C. and K.K. Reay, 1999, Atlas of Amphibians and Reptiles in Virginia, Special Publication No. 1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.) A digital recording has been deposited in the VHS archives (Digital voucher # 304)

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Hyla gratiosa* (Barking Treefrog) VA**: Brunswick Co., State Route 137 at State Route 617 (36° 54'22.44"N, 77° 59'57.64"W) and State Route 643 west of State Route 606 (36°54'17.49" N, 77° 53' 27.09" W). 27 May 2014. Brian Munford

County Record: On 27 May 2014, at approximately 22.00h, while conducting opportunistic survey work, two large Barking Treefrog choruses were noted and recorded. This observation is a new county record for this species in Virginia (Mitchell J.C. and K.K. Reay, 1999, Atlas of Amphibians and Reptiles in Virginia, Special Publication No. 1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.) A digital recording has been deposited in the VHS archives (Digital voucher # 295 and 296).

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Hyla squirella* (Squirrel Treefrog) VA**: Dinwiddie Co., State Route 626, Flatfoot Rd. at Winfields Millpond (36° 57.058 N, 77° 29.675 W). 26 June 2013. Brian Munford

County Record: On 26 June 2013, at approximately 22.00h, while conducting opportunistic survey work, a large Squirrel Treefrog chorus was noted and recorded. This observation is a new county record and represents a westward expansion in the distribution map of this species in Virginia (Mitchell J.C. and K.K. Reay, 1999, Atlas of Amphibians and Reptiles in Virginia, Special Publication No. 1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.) A digital recording has been deposited in the VHS archives (Digital voucher # 309)

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Hyla squirella* (Squirrel Treefrog) VA**: Prince George Co., State Route 618, E. Quaker Rd. (37° 07.781 N, 77° 13.585 W). 13 June 2013. Brian Munford

County Record: On 13 June 2013, at approximately 21.45h, while conducting opportunistic survey work, a Squirrel Treefrog chorus was noted and recorded. This observation is a new county record and fills a hiatus in the distribution map of this species in Virginia (Mitchell J.C. and K.K. Reay, 1999, Atlas of Amphibians and Reptiles in Virginia, Special Publication No. 1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.) A digital recording has been deposited in the VHS archives (Digital voucher # 303)

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Hyla gratiosa* (Barking Treefrog) VA**: Sussex Co., State Route 35 (36° 53.176 N, 77° 09.244 W). 26 June 2013. Brian Munford

County Record: On 26 June 2013, at approximately 20.15h, while conducting opportunistic survey work, a Barking Treefrog chorus was noted and recorded. This chorus was in conjunction with an Oak Toad chorus, a situation which repeated itself slightly later in the evening at another site. This observation is a new county record and fills a hiatus in the distribution map of this species in Virginia (Mitchell J.C. and K.K. Reay, 1999, Atlas of Amphibians and Reptiles in Virginia, Special Publication No. 1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.) A digital recording has been deposited in the VHS archives (Digital voucher # 310)

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Hyla gratiosa* (Barking Treefrog) VA**: Lunenburg Co., State Route 604 at State Route 137 (36° 55' 04.30" N, 78° 01' 54.39" W). 28 May 2014. Brian Munford

County Record: On 28 May 2014, at approximately 21.30h, while conducting opportunistic survey work, a Barking Treefrog call was noted and recorded. This observation is a new county record and represents a westward expansion in the distribution map of this species in Virginia (Mitchell J.C. and K.K. Reay, 1999, Atlas of Amphibians and Reptiles in Virginia, Special Publication No. 1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.) A digital recording has been deposited in the VHS archives (Digital voucher # 297)

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Anaxyrus quercicus* (Oak Toad) VA**: Sussex Co., State Routes 35, Jerusalem Plank Rd., and 607, Sandy Hill Rd. (36 50.725N, 77 09.687W, along Rt. 607 to 36° 50.901N, 77° 08.683W). 26 June 2013. Brian Munford

On 26 June 2013, from approximately 20.15h until 21.30h, while conducting opportunistic survey work, a continuous and raucous Oak Toad chorus was noted and recorded stretching approximately three quarters of a mile along State Rt. 607. This observation confirms a county record, and perhaps adds to the known populations of this state endangered species in Virginia. Additionally, at two sites (one at the intersection of State Rts. 35 and 631, the other at the southern end of the continuous chorus, Oak Toads were heard calling with Barking treefrogs, and recorded. (Mitchell J.C. and K.K. Reay, 1999, Atlas of Amphibians and Reptiles in Virginia, Special Publication No. 1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.) A digital recording has been deposited in the VHS archives (Digital voucher # 305)

Brian Munford
4021 Northrop Street
Richmond, VA 23225

***Hyla squirella* (Squirrel Treefrog) VA:** Chesterfield County, Bermuda Hundred Road (37° 20' 24.53" N, 77° 17' 26.01" W), and Ruffin Mill Road, State Route 746 (37 19' 16.19" N, 77 21' 54.70" W). 19 June 2014. Brian Munford

County Record: On 19 June 2014, while conducting opportunistic field survey work in Eastern Chesterfield County, Squirrel Treefrog choruses were heard and recorded. These observations constitute a new county record for this species and show a westward expansion of its known distribution in Virginia. (Mitchell, J.C. and K.K. Reay 1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries, Richmond, VA. 122 pp; Tobey, F. 1985. Virginia's Amphibians and Reptiles: A Distributional Survey. Virginia Herpetological Society, Purcellville, VA. 114 pp; and the Virginia Department of Game and Inland Fisheries wildlife database). Digital recordings of Squirrel Treefrog choruses have been deposited in the VHS archive (# 300)

Brian Munford
4021 Northrop Street
Richmond, Virginia 23225

Aspidoscelis sexlineata sexlineata (Eastern Six-lined Racerunner): VA, Bath Co., Beards Mountain at 670 m (37.95175 N -79.73087 W). 28 May 2014. Lance H. Benedict

County Record: The Eastern Six-lined Racerunner was first reported west of the Blue Ridge in the James River drainage by Hoffman (R.L. 1945. Notes on the Herpetological Fauna of Alleghany County, Virginia. *Herpetologica* 2:199-205) from Alleghany County. In a more detailed publication covering the same material (1986. The Herpetofauna of Alleghany County, Virginia, Part 3. Class Reptilia. *Catesbeiana* 6(1):4-10.), Hoffman stated that all four places in Alleghany County where he had located the species were below 365 m.

While walking the trail along the ridge of Beards Mountain in Bath County, I encountered several Eastern Six-lined Racerunners in a grassy bald at an elevation of 660 m. Directly adjoining the bald on either side of the ridge were shale barrens. The Eastern Six-lined Racerunner has not been previously documented for Bath County by Mitchell and Reay (1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries. Richmond, VA 122pp.) or the Virginia Herpetological Society (http://www.virginiaherpetologicalsociety.com/cgi-bin/herplist/action.php). Digital photographs of two specimens and their habitat were submitted to the VHS archives (# 313).

Lance H. Benedict
1918 Birch Rd
McLean, VA 22101

***Hyla cinerea* (Green Treefrog).** Chesterfield County: Henricus Historical Park and Dutch Gap Conservation Area. Various dates, ca. 1994-2014. Patricia A. Roble and Steven M. Roble.

County Record: In their recent summary of the spring 2011 VHS survey of Pocahontas State Park in Chesterfield County, VA, Gibson and Steele (2014. Results of the Survey of Pocahontas State Park. Catesbeiana 34: 3-14) stated that Green Treefrogs (*Hyla cinerea*) had not been documented in this county. I was surprised to learn this, because my wife and I, and probably many other local naturalists, have observed or heard this species at Henricus Historical Park and the adjacent Dutch Gap Conservation Area along the James River in the southeastern portion of the county on multiple occasions during the past two decades. Individual frogs have been found in gardens or on buildings at the historical park as well as inside a recently constructed (ca. 2010) greenhouse. Large breeding choruses have been heard in the nearby marshes within the Dutch Gap Conservation Area on various dates (mostly not recorded).

A review of Mitchell and Reay (1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication No.1. Virginia Department of Game and Inland Fisheries, Richmond, Virginia. 122 pp.) confirms the prior absence of a documented record for Green Treefrogs from Chesterfield County. A digital photograph (VHS Archive #317) of a Green Treefrog that was found on 18 September 2008 while perched on a fennel stem in the herb garden area of Henricus Historical Park has been deposited in the VHS archives in support of this report.

The summary by Gibson and Steele (op. cit.) also stated that Four-toed Salamanders (*Hemidactylium scutatum*) were known from Chesterfield County but had not been documented in Pocahontas State Park. However, Stevenson (1996. Field notes: *Hemidactylium scutatum* [Four-toed Salamander]. Catesbeiana 16: 20-22) reported finding numerous nesting and gravid females in a sphagnous depression in the park.

Steven M. Roble
Virginia Department of Conservation and Recreation
Division of Natural Heritage
600 E. Main Street
Richmond, VA 23219

Lampropeltis triangulum triangulum (Eastern Milksnake): VA, Craig Co., Potts Mountain at 1050 m (37.53518 N -80.23488 W). 21 May 2014. Robert T. Zappalorti

County Record: During a brief survey with Lance Benedict, Lorien Lemmon, and Jeff Dragon on the crest of Potts Mountain where it is crossed by Rte 311, Robert Zappalorti discovered an Eastern Milksnake under a piece of plywood at an elevation of 1050 m. Despite being fairly common in the Ridge and Valley province, the Eastern Milksnake has not been previously documented for Craig County by Mitchell and Reay (1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries. Richmond, VA 122pp.) or the Virginia Herpetological Society (http://www.virginiaherpetologicalsociety.com/cgi-bin/herplist/action.php). A digital photograph of the specimen was submitted to the VHS archives (# 314).

Lance H. Benedict
1918 Birch Rd
McLean, VA 22101

***Trachemys scripta elegans* (Red-eared Slider):** VA: Isle of Wight Co., 15069 Krisy Court Carrollton, 1 July 2013. Richard Routten.

County Record: On 30 June 2013, I saw a turtle nesting in my front flower bed at 15069 Krisy Court, Carrollton VA . The following morning during a hard rain, I saw either the same or a similar turtle walking across the front walk. I could then recognize the turtle as a Red-eared Slider. She crawled across the driveway, and dropped an egg in the process, on her way under my truck, apparently seeking shelter from the rain. I obtained some photos and sent several to the VHS. Upon checking the VHS Website, I noticed that the Red-eared Slider is not reported from Isle of Wight County. Mitchell and Reay (1999, Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries, Richmond, VA 122 pp) lists only Trachemys scripta scripta from Isle of Wight. Mitchell (1994.

The Reptiles of Virginia, Smithsonian Institution Press, Washington DC 352 pp.) indicates there may be intergrades between Trachemys scripta scripta and T. s. elegans, but no pure T. s. elegans, which are only found two counties to the north of Isle of Wight. This find thus represents a new record for Isle of Wight County. Photos were deposited in the VHS Archive (#293) as a voucher.

Richard D Routten
Kecoughtan High School
522 Woodland Road
Hanpton, VA 23669

***Nerodia erythrogaster* (Plain-bellied Water Snake) VA**: Dinwiddie Co., 21501 Reese Road Dinwiddie (36° 58.935 N, 77° 31.958 W) 14 June 2014. Douglas Reese and James Reese

County Record: On 14 June 2014, my brother and I observed the head of a snake protruding from the folds of an old tarp next to a riding mower. We finally saw most of its body and decided we had never seen this particular snake previously. I captured the snake and kept it over-night. The snake was approximately one meter in length. I took pictures of it which I sent via email to the Virginia Herpetological Society for identification. The snake was identified as the Plain-bellied Watersnake. The Plain-bellied Water Snake has not been previously documented for Dinwiddie County by Mitchell and Reay (1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries. Richmond, VA 122pp.), or Mitchell (1994. The Reptiles of Virginia, Smithsonian Institution Press, Washington DC 352 pp.). This find represents a range extension of approximately 25 km. west of the nearest location in Sussex County. I released the snake into Sappony Creek about 150 meters from the point of discovery. A digital photograph (# 294) was deposited in the VHS Archive as a voucher.

Douglas Reese
21501 Reese Road
Dinwiddie, VA 23841

***Pantherophis alleghaniensis* (Eastern Ratsnake) VA**: Fairfax Co., 4417 Dixie Hill Rd, Fairfax, VA (38.51'11.52 N 77.21'47.64" W). September 20, 2014 Mark Khosravi.

Coloration: An atypically colored adult *Pantherophis alleghaniensis* was captured on 20 September 2014 at approximately 11:00h by Mark Khosravi. Unlike typical *Pantherophis alleghaniensis* as described by Mitchell (1994. The Reptiles of Virginia. Smithsonian Institution Press, Washington D.C. 352 pages.), Ernst (Carl H. and Ernst, Evelyn M. 2003. Snakes of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 668 pages.), Linzey (Donald W. and Michael J. Clifford. 2002. Snakes of Virginia. University Press of Virginia, Charlottesville, VA. 173 pages.) and other references, this specimen has an unusual abundance of reddish coloration along the medial and lateral surfaces. There is some speculation that this specimen may have been an escaped or liberated pet. However, *Pantherophis alleghaniensis* is somewhat uncommon in the pet trade. Digital photos have been submitted to the VHS archives (#318).

Mark Khosravi
7155 Main Street
Clifton, VA 20124ddress

***Thamnophis sirtalis* (Eastern Gartersnake)**. VA: Navy Auxiliary Landing Field (NALF) Fentress, City of Chesapeake, VA (N36°67'74.20", W76°15'74.20"). 08 May 2014. Paul Block

Coloration: On 8 May 2014 at 13:11 h, Navy Ecologist Paul Block observed a non-typical color-phase of an Eastern Gartesnake while a conducting a herpetological survey with Navy Biologist Chris Petersen in support of Navy Natural Resource Specialist Michael Wright's management of NALF Fentress. The Gartersnake exhibited an unusual base coloration of reddish orange with yellow striping. The snake was observed in leaf-litter near an open and sunny tree downfall area within mixed deciduous woodlands approximately 10 meters from a small creek. The length of snake was estimated to be 38-46 cm. Weather conditions were clear with ambient temperature estimated to be 29 degrees C. A digital photograph was submitted to the VHS archives (voucher #316).

Paul A. Block
5 Kensington Court
Williamsburg, VA 23188

***Terrapene carolina carolina* (Eastern Box Turtle)** VA: Dinwiddie County, Lot 3, Loftis Lane Wilsons (N 37° 6' 29", W 77° 49' 4") 03 July 2013. David P. Hair, Jonathan D. Jeffreys.

County Record: On 03 July 2013 at 10:35 two male Eastern box turtles (*Terrapene carolina carolina*) were noted approximately two meters apart in an uncut portion of Lot 3. The turtles were hand captured and morphometric data were obtained. Specimen 1: carapace—108.0 mm, plastron—97.0 mm, weight—301 g; specimen 2: carapace—114.0 mm, plastron—105.0 mm, weight—450 g. After photographs were obtained, both specimens were released. While the Eastern box turtle has been observed at both the east and west edges of the county, according to Mitchell and Reay (1999, Atlas of Amphibians and Reptiles in Virginia. Special

Publication Number 1, Virginia Department of Game and Inland Fisheries, Richmond, Virginia. 77 pp.) this species has not yet been recorded for Dinwiddie County proper. The one record for the box turtle in the FWIS Database for Dinwiddie County has a broad location stretching from Dinwiddie to Nottaway Counties on Fort Pickett, such that the precise location cannot be determined, nor the exact county in which this species was observed. Digital voucher photographs have been submitted to the VHS Archive (# 315).

Jonathan D. Jeffreys
P.O. Box 96
Hopewell, VA 23860

President's Corner

"How can I help?"

I hear this question often, but really I do not hear it often enough. If you are reading this, chances are you have already contributed greatly to the VHS's mission. Your membership dues almost entirely finance the Society, and most of that money will fund research grants and educational material. Thank you.

There are plenty of ways you can help reptiles and amphibians that are relatively simple, but can have a big impact. Places like the Virginia Living Museum in Newport News, depend heavily on volunteers just to do basic feeding and cleaning. There are plenty of volunteer opportunities at state parks, city parks, nature centers, and other zoos and museums around the state. Most of those places do not have anyone or anything dedicated towards education about native herps. That is where you might fit in!

I know several members and herp enthusiasts that have had great success with passing out flyers in their neighborhoods advertising their help with any questions about reptiles and amphibians. The best responses come from members that ask their neighbors to call them before they consider killing a snake. Usually, neighbors can be talked out of killing the snake, and sometimes they'll allow a member to remove the snake from the yard and the danger. Our new newsletter co-editor, Joellen Welch, has become a herp-liaison for her very large neighborhood of nearly 4,000 homes. She routinely answers questions from hundreds of people in her neighborhood about almost all things wildlife. Joellen has no particular specialty or education in a related field; instead, she has what most people have that are reading this: an enthusiasm for learning and a concern for keeping our native herps out of harm's way. If you don't know an answer, our website is usually sufficient. If you still can't figure it out, send us an email or ask on our Facebook page.

Getting even more involved in the VHS may not necessarily require a big commitment. Once a year, you could do something as simple as show up to one of our Fall Meetings and help set up and break down, for example. We could always use an auctioneer for our live auction. That equates to about 30 minutes of work a year, but still a big relief to us!

As the VHS has expanded, we have had a greater demand for group leaders during our surveys. If you are knowledgeable about native herps, and don't mind being the one to navigate and record data, then we have a once-a-year job that would help us out greatly! Otherwise, we are always in need of someone skilled in graphic design. Educational graphics, such as arranging text descriptions with photos, creating photo illustrations of identifying characteristics, are practically a limitless source of jobs to do.

Still interested in helping? Even if you don't know what you could do, or what skills you may have that would be useful, send me an email. We could easily create a spot for you to fill in!

President Kory Steele

Minutes of the Spring 2014 VHS Meeting

Virginia Herpetological Society
Spring Survey Business Meeting-James River State Park
Minutes of Meeting

Kory Steele, President of the Virginia Herpetological Society (VHS), opened the meeting shortly after 18:00 hr. on 5/16/2014 and provided the agenda for the meeting.

Old Business

There were no remaining old business items to discuss.

Committee Reports

Newsletter Report

Kory Steele presented the Newsletter Report on behalf of VHS editor Susan Watson, who was unable to attend. The main point was to remind the VHS Executive Committee and other attending VHS Members to provide relevant news items to Susan in time for the next publication.

Catesbeiana

Paul Sattler, Editor of Catesbeiana, reported that two major surveys had been edited and he expected that the next issue of Catesbeiana would be sent out in 1 to 2 weeks.

Treasurer/Secretary

David Perry, VHS Treasurer, reported that as of 5/14/2014 the VHS cash balance totaled $10,827.43. However, the $500 VHS Grant Award to Linda Augustine had not yet posted and he recommended follow-up with Linda. The VHS currently has 217 members and 2,380 Facebook fans. However, eighty-eight 2013 annual members did not yet renew for 2014 which may indicate a membership retention issue.

Conservation

David Perry, VHS Conservation Committee chairman, reported that the Conservation Committee would focus on projects that involved Tier I through Tier IV amphibians and reptiles as defined by the Virginia Department of Game and Inland Fisheries (VDGIF). The two projects being pursued for 2014 are Canebrake Rattlesnake surveys at Cavalier Wildlife Management Area (CWMA) in support of a future VDGIF tracking program and a Pinesnake sign post campaign within the projected Virginia range of this species. The first Canebrake survey at CWMA was held on Sunday May11 with 19 VHS participants. No rattlesnakes were captured and a second survey has been scheduled at CWMA for Sunday June 8. A total of about 42 Pinesnake sign posts are planned for Claytor Lake (2), Douthat (~10) and Hungry Mother (16) State Parks, The Nature Foundation at Wintergreen (13) and Short Hills WMA (1). Washington and Jefferson National Forests have also been contacted but a sign post commitment has not yet been received.

Research

Michael Meyers, Research Committee chairman, could not attend and a Research Report was not received by the start of the meeting.

Education
Mike Clifford, Education Committee chairman, could not attend the meeting but did provide an interim report which was included in the meeting agenda by Kory Steele and follows:
At any time during the year, VHS members can email brief accounts of their herp educational activities (local, regional, or state) to the VHS Education Committee chairman for inclusion in the annual report.

The VHS website continues to serve as the leading public information source concerning the state's native reptiles and amphibians.

Our herp identification and information service for the general public is heavily utilized. Visitors to both the VHS website and Facebook page are directed to submit their questions and photos to: animal-id@vaherpsociety.com. Most of the inquiries relate to herp identification, but some concern care in captivity, reptile rescue concerns, and requests to use our photos.

Master Naturalist chapters, Virginia State Parks, and youth/school organizations are our most frequent "customers" for presentations. VHS receives many requests for presentations for which we are unable to find speakers. Members, who are interested in helping with presentations & exhibits are encouraged to contact the Education Committee chairman.

HerpBlitz
Jason Gibson, HerpBlitz chair, reported the annual HepBlitz will be held at Belmead Plantation in Powhatan on Saturday June 21 & 22. The survey area comprises about 2200 acres of very interesting habitat. This same location was surveyed in 2013 but inclement weather impacted the survey results. Registration is required and can be made online through the VHS website.

Webstore & Advisory Committee
No updates to report.

Website
Kory Steele reported for John White, VHS Webmaster, who was unable to attend. The VHS website was completely revamped in February and is now mobile friendly. Many superlative comments have been made about the new format, including one as far away as Wisconsin. As of 5/14/2014, web hits for this year totaled 10, 275,722.

New Business
Kory Steele introduced several new business topics.

Newsletter Changes
Kory Steele proposed that the frequency of the newsletter be increased to 3-4 issues per year with a reduced page count, but higher impact/more visibly appealing pages. Perhaps more frequent newsletters might help with membership retention.

Co-Newsletter Editor
Kory Steele outlined plans to appoint a Co-Newsletter Editor to assist Susan Watson with this VHS publication. Susan has been in the position for 4 years and could use some assistance. JoEllen Welch, a first year VHS member, with a master's degree in GIS, has expressed a strong interest in the position.

Advisory Committee
Kory Steele announced the appointment of Bonnie Keller to the VHS Advisory Committee to replace Craig Pelke who moved to Texas. Bonnie Keller is a longtime VHS member, who also operates a successful reptile rescue business.

Special Thanks
A special tribute was paid to Craig Abbott, who fabricated and donated 20 snake hooks to VHS.

With no further business to discuss, the business meeting was adjourned.

David A. Perry
VHS Treasurer/Secretary

Virginia Herpetological Society
Treasurer's Report
October 18, 2014

Previous Report Balance - May 14, 2014	$10,827.43
Net Receipts (excludes PayPal fees):	
May Dues (5/15-5/31)	$366.05
Spring Survey Magnet Sales	$45.00
Return Spring Survey Cash Draw	$240.00
June Dues	$36.89
Donations	$97.50
Café Press Commission	$34.81
July Dues	$15.00
August Dues	$84.63
Donations	$24.15
September Dues	$294.53
Café Press Commission	$27.65
October Dues (10/01-10/18)	$218.52
Return Annual Meeting Cash Draw	$240.00
Annual Meeting-Live Auction	$60.00
Annual Meeting-Silent Auction	$92.00
Annual Meeting-Lunch Sales	$259.00
Total Net Receipts	$2,135.73
Disbursements:	
Spring Survey Materials	$82.65
Spring Survey Cash Draw	$240.00
VHS Grant Award-Augustine	$500.00
Spring Survey Magnet Expense	$51.99
Catesbeiana Postage	$26.64
Poster Donation-Greg Zell Park Ranger Training Institute Presentation	$28.49
Annual Meeting Cash Draw	$240.00
Annual Meeting-Lunch Expense	$290.49
Annual Meeting-Breakfast/Misc. Expense	$90.66
Annual Meeting-Photo Contest Award	$50.00
Total Disbursements	$1,600.92
Current Balance -October 18, 2014	$11,362.24

VHS Membership: 249, Facebook Fans: 2,974

David Perry, VHS Secretary/Treasurer

Presentations at the Fall 2014 Meeting at Three Lakes Park:
October 4, 2014

The Development of an Electric Fence for Reducing Freshwater Turtle Nest Predation,
Greg Geller

Herp Dept Updates at the National Zoo and Progress of the Appalachian Salamander Exhibit,
Matt Neff

Cat Ponds and Chicken Turtles: Management of Virginia's Rarest and Most Endangered Trutle,
J.D. Kleopfer

Status of Snake Fungal Disease in Virginia; Preliminary Results from Southeastern Virginia,
Amanda Guthrie

The Reptile Database: A Global Species Database for Local Herpers, Made in Richmond, VA,
Peter Uetz

The recent death of Dr. Donald Merkle was announced. An obituary will follow in the Spring 2015 issue of *Catesbeiana*.

Field Notes

The field notes section of *Catesbeiana* provides a means for publishing natural history information on Virginia's amphibians and reptiles that does not lend itself to full-length articles. Observations on geographic distribution, ecology, reproduction, phenology, behavior, and other topics are welcomed. Field Notes will usually concern a single species. The format of the reports is: scientific name (followed by common name in parentheses), state abbreviation (VA), county and location, date(s) of observation, observer(s), data and observations. The name(s) and address(es) of the author(s) should appear one line below the report. Consult the editor if your information does not readily fit this format. **All field notes must include a brief statement explaining the significance of the record** (e.g., new county record) **or observation** (e.g., unusual or rarely observed behavior, extremely early or late seasonal record, abnormal coloration, etc.). Submissions that fail to include this information are subject to rejection. Relevant literature should be cited in the body of the text (see Field Notes in this issue for proper format). All submissions will be reviewed by the editor (and one other person if deemed necessary) and revised as needed pending consultation with the author(s).

If the field note contains information on a **new county (or state) record**, **verification is required in the form of a voucher specimen** deposited in a permanent museum (e.g., Virginia Museum of Natural History) or a **photograph** (print, slide, or digital image) **or recording** (digital recording of anuran calls) deposited in the archives of the Virginia Herpetological Society. Photographs and recordings should be sent to the editor for verification and archiving purposes; the identity of voucher specimens must be confirmed by a museum curator or other qualified person. Include the specimen number if it has been catalogued. Prospective authors of distribution reports should consult the VHS website (County/City Herp Lists) to determine if they may have a new county record. New distribution records from large cities that formerly constituted counties (Chesapeake, Hampton, Newport News, Suffolk, and Virginia Beach) are acceptable, but records from smaller cities located within the boundaries of an adjoining county will only be published if the species has not been recorded from that county. Species identification for observational records (e.g., behavior) should be verified by a second person whenever possible.

PHOTOGRAPHS

High contrast photographs (digital images) of amphibians and reptiles will be considered for publication if they are of good quality and are relevant to an accompanying article or field note. Published photographs will be deposited in the Virginia Herpetological Society archives.